ESA-054-2 Huber Engineered Woods - Broken Bow, OK
Public Report

Introduction:
This facility employs about 150 people to manufacture oriented strand board (OSB). The facility operates 7 days/week, 24 h/day with about 18 scheduled down days per year. In the manufacturing process, logs are received by truck from nearby logging operations and stacked outside. The logs are fed to debarkers, then to stranders which cut the logs into strands. The strands are dried in 20 ft diameter rotating drums with heat from bark burning furnaces. Next the strands are screened to grade for three specific sizes. The dried strands are sprayed with a liquid resin and wax in three blending drums and transported on a conveyer system to the forming line bunkers, where the layers are cross-oriented while forming mats. The mats are oriented in a four-layer process in which two core layers are oriented perpendicular to two surface layers. The mats are trimmed to a workable size and then fed to a continuous press where the wood strands, glue and wax are bonded together under heat and pressure to create the OSB structural panel. The 8 ft by 24 ft master panels are then cooled and stacked into units and sent to finishing, where cut to size, sanded as needed, marked, edge sealed, bundled into standard units, and stacked in a warehouse. Finished product units are shipped from the warehouse by truck and rail.

Compressed air is used throughout the plant to serve air tools, air cylinders, blowoff guns, and other pneumatic equipment. Some open-end blowing is also used to keep optical sensors clean and until recently, used to cool bearings on select fans and other equipment. The compressed air system consists of four identical 200 hp Atlas Copco GA-160-125 lubricated rotary screw compressors rated at 890 cfm at 125 psig full load pressure. The compressors supply air at about 108 psig to the plant.

Objective of ESA:
The objective of the ESA was to identify potential energy savings opportunities related to the compressed air system while introducing facility personnel to the U.S. Department of Energy's AIRMaster+ and the Compressed Air Challenge's LogTool software tools.

Focus of Assessment:
The primary focus of the ESA was operation of the compressor performance and sequencing to meet the plant loads. Additionally, production equipment was examined to observe the compressed air end uses and understand the equipment needs in the plant. Recording dataloggers were used to determine: 1) the current draw on all four compressors located in two compressor rooms; and 2) the pressure profile at the North Compressor Room receiver (NCRR), the South Compressor Room Receiver (SCRR), and the quality control lab on the far south end of the warehouse. The loggers were installed on the first day of the ESA and gathered about 48 hours worth of data.

Approach for ESA:

1. A kickoff meeting was held with the Site Lead, Corporate Engineer, and the Energy Expert to review the objectives of the ESA and review the ESA procedures. Plant and corporate personnel also discussed their expectations for the ESA and reviewed the compressed air system at the plant.
2. A tour of the compressed air rooms and the production operations was conducted by plant and corporate staff and the Energy Expert. During this tour, nameplate information and rated performance information on the compressors was collected and some of the compressed air end uses were observed.
3. A training session was conducted for plant staff and corporate engineers to provide background information on the ESA program and introduce the concepts used in the AIRMaster+ and LogTool software tools.
4. The Site Lead and Energy Expert discussed the datalogging capabilities and decided upon locations to place recording dataloggers. The dataloggers were placed in several locations in the plant.
5. Corporate engineers accessed the plant's compressor control system and exported compressor performance data for use with the LogTool software.
6. Additional training was held to introduce the AIRMaster+ and LogTool software.
7. The Energy Expert, plant Mechanical Team Leader, and corporate engineers brainstormed to discuss and agree on potential energy efficiency opportunities to investigate.
8. The compressor performance data was used to develop a compressor/system model in LogTool and the AIRMaster+ model.
9. The AIRMaster+ and LogTool models were used to quantify potential opportunities.
10. A debrief presentation detailing the process and the opportunities developed during the ESA was presented to the plant management by the Energy Expert and the Plant Engineer.

General Observations of Potential Opportunities:
From information supplied by the plant, this facility used more than 200,000 MMBtu/yr (58,706,000 kWh/yr) of electricity and more than 200,000 MMBtu/yr of gas in 2006. Compressor current and pressure data collected from a two-day period from June 13-15, 2007 was used to develop a baseline AIRMaster+ model of the compressed air system at this plant. The table below summarizes the results of this model:

AIRMaster+ Baseline Model Results

	Model	Manufacturer	Compressor Type	Compressor	Control Type	Rated Full Load Pressure *psig*	Rated Capacity *acfm*	Power Rating *hp*
Compressor #1	GA-160-125-AP	Atlas Copco Compressors Inc.	Single stage lubricant-injected rotary screw	NCR - Comp. 1 (N)	Load/unload	125	890	200
Compressor #2	GA-160-125-AP	Atlas Copco Compressors Inc.	Single stage lubricant-injected rotary screw	NCR - Comp. 2 (S)	Load/unload	125	890	200
Compressor #3	GA-160-125-AP	Atlas Copco Compressors Inc.	Single stage lubricant-injected rotary screw	SCR - Comp. 3 (N)	Load/unload	125	890	200
Compressor #4	GA-160-125-AP	Atlas Copco Compressors Inc.	Single stage lubricant-injected rotary screw	SCR - Comp. 4 (S)	Load/unload	125	890	200
TOTALS						500	3,560	800

	Model	Average Airflow *acfm*	Average Airflow *% System*	Peak Demand *kW*	Load Factor *%*	Annual Energy Consmpt'n *kWh/yr*	Annual Energy Cost *per year*	Annual Demand Cost *per year*
Compressor #1	GA-160-125-AP	0	0%	3.4	1.3%	19,146	$951	$126
Compressor #2	GA-160-125-AP	905	100%	175.7	100.9%	1,446,861	$71,841	$6,536
Compressor #3	GA-160-125-AP	739	82%	172.9	88.6%	1,321,262	$65,605	$6,432
Compressor #4	GA-160-125-AP	901	100%	176.7	101.8%	1,460,349	$72,511	$6,573
TOTALS		2,545	70.5%	528.7	73.3%	4,247,618	$210,908	$19,667

The compressed air system uses about 6% of the total electric energy consumption (kWh) at this plant.

The following Near Term, Medium Term, and Long Term Opportunities were identified during the ESA:

1. Reduce Air Leaks (Near Term Opportunity)
   Air leaks and inappropriate air uses are considered to be significant loads at this plant. Anecdotally, plant personnel mentioned that when the plant first opened three years ago, the entire plant could be served by two air compressors. But given the normal expansion and addition of air uses and air leaks, the plant now runs on two base-loaded compressors, one trim compressor that runs at about 75% loaded, and a second trim compressor that only comes on with large air demands that drop the system pressure below about 102 psi. Plant personnel recognize the need to repair air leaks and have bought a leak detector and tasked a technician with searching for, tagging, and fixing air leaks in the plant. To date, only some of the northern sections of the plant have been examined. This program should be continued. At most plants the typical leak load is 20-40% of the total system airflow. At this facility, the total flow is about 2,550 cfm, so 20% would be 510 cfm. Allowing for the savings already found, the system was modeled in AIRMaster+ using a current air leak load of 400 cfm.

   Assuming that the leak load could be reduced by 75% through a thorough inspection and repair program, the air savings would be 300 cfm or roughly 1/3 of an air compressor. The AIRMaster+ model projects that this level of leak reduction would result in a energy savings of about 251,000 kWh/yr, peak demand savings of about 27 kW-month, and cost savings of about $13,500/yr. The cost to repair the leaks is estimated at about $1,000 for material costs, resulting in a simple payback of less than one year. It should be noted that these savings are likely conservative – the compressor is rated at 19.7 kW per 100 cfm, so a savings of 300 cfm would likely be closer to about 60 kW-month and about 491,000 kWh/yr or a total of about $26,600/yr

2. Improve End Use Efficiency - Wands (Near Term Opportunity)
   Another significant use of compressed air is cleaning with compressed air blowoff wands. Plant personnel currently use an OSHA approved air gun with an enhanced venturi nozzle. The air inlet is ¼" with a ¼" nozzle at the tip. The estimated air flow at 100 psi is about 100 cfm. The estimated daily usage for blowdown is two wands, 24 h/day, based on the results of a discussion with a Shift Team Leader during the ESA and summarized in the table below:

AREA	Est. Blowdown
Green End	3 h/shift
Heat & Energy	3 - 5 h/shift
Blending, Forming & Press	4 - 6 h/shift
Sander	1 h/shift
TOTAL	**13 h/shift**

   If the air use could be reduced by a combination of more efficient equipment and/or changes in operating procedures to reduce the flow to one wand, the savings would be about 100 cfm. The AIRMaster+ model projects that this reduction in consumption would result in energy savings of about 135,300 kWh/yr, peak demand savings of about 15.8 kW-month, and cost savings of about $7,300/yr. More efficient nozzles are likely about $50 each, and a reasonable estimate is that 10 wands would be needed, resulting in an implementation cost of $500 and a simple payback of less than one month.

   A similar formulation can be used for other end uses at the plant. For example, ¼" open air lines are used in some locations to keep optical sensors free of dust. An open line of this size would use about 90 cfm and if operating during the normal production hours of 8,204 h/yr, would cost about $6,600/yr. Installing more efficient venturi-type air nozzles to reduce air consumption or solenoid valves on timers to reduce the usage time (as has been done in some instances in the plant) would help to make additional improvements in end use efficiency.

3. Reduce Pressure Drop in the Compressor Room (Medium Term Opportunity)
   Plant personnel have recently lowered the plant air pressure from about 114 psi to about 108 psi, in part based on a compressed air workshop sponsored by a compressed air equipment vendor that was attended the lead mechanical maintenance supervisor. Further savings can be realized if the system pressure in the plant could reduced by another 5 psi. However, some of the most critical equipment in the plant requires a minimum of 96 psi to function properly. This equipment could be buffered with additional storage capacity or some other means to assure proper operation. A standard rule-of-thumb is that 1% energy savings will result from every 2 psig pressure drop, or about 2.5% for a 5 psi pressure drop. The AIRMaster+ model projects a savings of 4.1% or about 175,000 kWh/yr, 22 kW-mo., and $9,500/yr. Additional research will be required to determine the feasibility of lowering the pressure – it may be as simple as readjusting the controls on the trim compressor. However, care must be taken to assure the production is not adversely affected by such a change.

The energy savings from these five opportunities total about 561,200 kWh/yr and $30,300/yr, as shown in the table below:

ENERGY EFFICIENCY MEASURES (EEMs) SUMMARY									
Description	EEM No.	Energy Savings *kWh/yr*	Energy Cost Savings *per year*	Energy Savings	Demand Savings *kW-mo*	Demand Savings *per year*	Installed Cost	Total Savings *per year*	Simple Payback *years*
Reduce Air Leaks	1	250,993	$12,463	5.9%	26.9	$1,001	$1,000	$13,464	0.1
Improve End Use Efficiency - Wands	2	135,290	$6,718	3.2%	15.8	$588	$500	$7,306	0.1
Reduce System Air Pressure	3	174,946	$8,687	4.1%	21.8	$811	$0	$9,498	0.0
TOTALS		**561,229**	**$27,868**	**13.2%**	**64.5**	**$2,400**	**$1,500**	**$30,268**	**0.0**

About 69% of the identified electricity savings would result from Near Term Opportunities, with 31% from Medium Term Opportunities.

Definitions:

- Near term opportunities would include actions that could be taken as improvements in operating practices, maintenance of equipment or relatively low cost actions or equipment purchases.
- Medium term opportunities would require purchase of additional equipment and/or changes in the system. It would be necessary to carryout further engineering and return on investment analysis.
- Long term opportunities would require testing of new technology and confirmation of performance of these technologies under the plant operating conditions with economic justification to meet the corporate investment criteria.

Management Support and Comments:
Plant and corporate engineering personnel are pursuing energy efficiency, operating cost, and safety improvements throughout the site. Energy savings appears to be a priority at multiple levels of site and corporate management and engineering groups. Management and plant personnel were supportive of the ESA and the results derived from the training assessment. Corporate engineering staff will likely use AIRMaster+ and LogTool to assess energy saving opportunities at sister plants, while plant staff will likely find LogTool be most helpful in identifying additional opportunities at this plant.

DOE Contact at Plant/Company: (who DOE would contact for follow-up regarding progress in implementing ESA results…)

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